FOREST PRODUCTS
Project Fact Sheet

INTERMEDIATE-SIZED, ENTRAINED PARTICLES: "CHARACTERIZATION, FORMATION, AND CONTROL"

BENEFITS

- Improves understanding of ISP formation
- Increases pulp production and productivity
- Predicts boiler performance more accurately
- Decreases boiler down-time
- Avoids conditions for excessive deposits
- Increases energy efficiency
- Reduces emissions of particulates

APPLICATIONS

Since recovery boilers are used in virtually every pulp mill, potential market penetration of the technology in the pulp and paper industry is 100 percent. It should also be adopted rapidly by the industry, considering the involvement of an industrial consortia in the project.

Research Findings Will Lead to New Recovery Boiler Designs and Improved Boiler Performance

Recovery boilers are used in nearly all pulp and paper mills to recover inorganic chemicals for recycling through the mill and to transform the organic portion of black liquor to thermal energy for generating steam or electrical power. Although it has never been proven, intermediate-sized particles (ISPs) of 1 to 100 microns are probably important in forming deposits that foul and plug boilers, interfering with their operation in convection passes. ISPs may represent the traditional "carryover particles" that originate as liquor droplets or particles from char beds that burn out in flight, as well as the "fume" deposits from vapor recondensation.

Investigators need to characterize the particles that accumulate in commercial furnaces and gain a better understanding of how they form. Once this is done, researchers will be able to develop methods for controlling their impact on boiler operations.

The benefits of this research will be enhanced mill productivity resulting from less boiler downtime and improved capacity for processing liquor. Modeling of boilers and developing new designs for air and liquor delivery systems will help minimize the formation of ISPs, saving energy and money for pulp and paper mills.

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PROJECT DESCRIPTION

Goal: To quantitatively measure the concentration of intermediate-sized particles in recovery boiler deposits, determine how they are formed and deposited, and propose methods to control their effects on boiler operation.

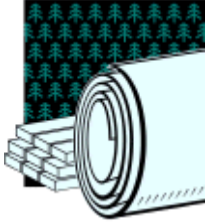
There are three primary tasks in this three-year effort. In Task 1, systematic field tests will be carried out using extractive probes and other traditional instruments capable of detecting the concentrated intermediate-sized particles in commercial units. Quantitative estimates will be made and the ISPs will be characterized as a function of operating conditions and unit design. In Task 2, laboratory tests will determine the mechanisms and rates of ISP formation in flight and from a char bed. In addition, splatter plate investigations will be conducted to determine size distributions from commercial operations. Data will be incorporated into furnace models to predict the effects of entrained particles and the efficacy of various control strategies. Task 3 will involve postulating control strategies and verifying their effectiveness through modeling and experimentation. Evaluation may be primarily through computer simulation, once the control mechanisms are known.

PROGRESS & MILESTONES

- Assemble an industrial advisory group.
- Develop a detailed project plan and assignments for team members.
- Complete the field instrumentation and the first round of ISP field characterizations.
- At the end of Year 1, make a Go/No Go decision regarding the importance of ISPs in commercial boilers.
- Complete the initial laboratory analyses of formation mechanisms.
- Complete the preliminary algorithms including parameter specifications, describing rates of formation of ISPs.
- At the end of Year 2, make a Go/No Go decision regarding the potential to control ISPs.
- Implement rate expressions in comprehensive code and compare to quantified field data.
- Evaluate control mechanisms based on predicted results.
- Compare predicted controls to field performance where possible.
- By the end of Year 3, complete a final report.

Completed Work:

- Sandia National Laboratory decided to combine this project with "Growth and Property Development of Convection Pass Deposits in Recovery Boilers" (reported previously).



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